Part 1

Average Rate of Change

`ARoC1.tex`

Exercise 1 *Melinda grows a unique type of mango known for its sweetness and smoothness. Because of this, the price of a mango increases with the distance from Melinda's farm. The function M gives the price of a mango in dollars given the distance x in miles from Melinda's farm:*

$$M(x) = \frac{1}{100}x^2 + 4$$

(a) *Compute $AV_{[1,10]}$.*

$AV_{[1,10]} = \$\boxed{1.11}$ *per mile from Melinda's farm.*

(b) *Compute $AV_{[200,300]}$.*

$AV_{[200,300]} = \$\boxed{5}$ *per mile from Melinda's farm.*

`ARoC2.tex`

Exercise 2 *The temperature T in degrees Fahrenheit t hours after 6 AM is given by:*

$$-\frac{1}{2}t^2 + 8t + 32,$$

for $0 \leq t \leq 12$.

(a) $T(4) = \boxed{56}^\circ F$. *This is the temperature at*

Multiple Choice:

(i) *4AM.*
(ii) *10AM.* ✓
(iii) *4PM.*
(iv) *10PM.*

(b) *The average rate of change of T over the interval $[4, 8]$ is* $\boxed{2}$.

(c) *The average rate of change of T from $t = 8$ to $t = 12$ is* $\boxed{-2}$.

(d) *The average rate of temperature change between 10 AM and 6 PM is* $\boxed{0}$.

(e) *The units for the rates above are*

Multiple Choice:

(i) *degrees Fahrenheit.*

(ii) *degrees Celsius.*

(iii) *degrees Celsius per hour.*

(iv) *degrees Celsius per minute.*

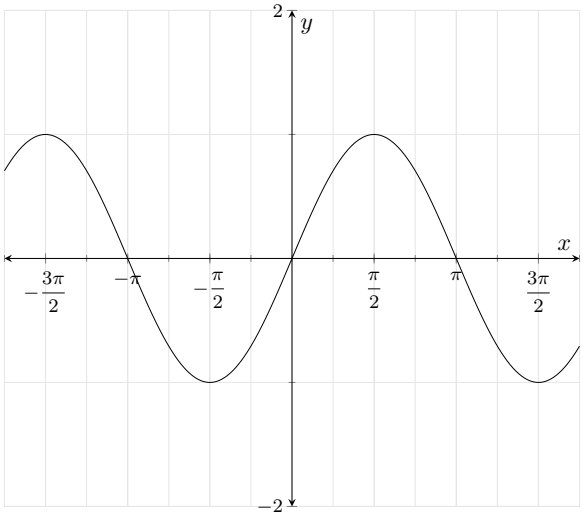
(v) *degrees Fahrenheit per hour.* ✓

(vi) *degrees Fahrenheit per minute.*

`ARoC3.tex`

Exercise 3 *Let* $f(x) = \sin(x)$. *The following information about the sine function may be helpful.*

$f(x) = \sin(x)$



Important Values of $f(x) = \sin(x)$	
x	$f(x)$
$-\pi$	0
$\frac{-\pi}{2}$	-1
0	0
$\frac{\pi}{2}$	1
π	0
$\frac{3\pi}{2}$	-1
2π	0

(a) *Compute* $AV_{\left[-\pi, \frac{3\pi}{2}\right]}$. *Give an exact answer.*

$AV_{\left[-\pi, \frac{3\pi}{2}\right]} = \boxed{-\frac{2}{5\pi}}$.

(b) *Based on your answer above, the sine function is*

Multiple Choice:

(i) *increasing on the interval* $\left[-\pi, \frac{3\pi}{2}\right]$.

(ii) *decreasing on the interval* $\left[-\pi, \frac{3\pi}{2}\right]$.

(iii) *constant on the interval* $\left[-\pi, \frac{3\pi}{2}\right]$.

(iv) *increasing on average on the interval* $\left[-\pi, \frac{3\pi}{2}\right]$.

(v) *decreasing on average on the interval* $\left[-\pi, \frac{3\pi}{2}\right]$. ✓

(vi) *constant on average on the interval* $\left[-\pi, \frac{3\pi}{2}\right]$.

(c) *Compute* $AV_{[0,2\pi]}$.

$AV_{[0,2\pi]} = \boxed{0}$.

(d) *Based on your answer above, the sine function is*

Multiple Choice:

(i) *increasing on the interval* $[0, 2\pi]$.

(ii) *decreasing on the interval* $[0, 2\pi]$.

(iii) *constant on the interval* $[0, 2\pi]$.

(iv) *increasing on average on the interval* $[0, 2\pi]$.

(v) *decreasing on average on the interval* $[0, 2\pi]$.

(vi) *constant on average on the interval* $[0, 2\pi]$. ✓

`ARoC4.tex`

Exercise 4 *The height of an object dropped from the roof of an eight story building is modeled by* $h(t) = -16t^2 + 64$, *where* $0 \leq t \leq 2$. *Here,* h *is the height of the object off the ground in feet,* t *seconds after the object is dropped.*

The slope of the line through the points $(0, h(0))$ *and* $(2, h(2))$ *is* $\boxed{-32}$.

`ARoC5.tex`

Exercise 5 *Using data from Bureau of Transportation Statistics, the average fuel economy* F *in miles per gallon for passenger cars in the US can be modeled by* $F(t) = -0.0076t^2 + 0.45t + 16$, *for* $0 \leq t \leq 28$, *where* t *is the number of years since 1980.*

(a) *Compute* $AV_{[0,28]}$.

$AV_{[0,28]} = \boxed{0.2372}$.

(b) *In this context,* $AV_{[0,28]}$ *represents*

Multiple Choice:

(i) *the average fuel economy for passenger cars in the US from 1980 to 2008.*

(ii) *the average price of fuel in the US from 1980 to 2008.*

(iii) *the average rate of change of the average fuel economy for passenger cars in the US from 1980 to 2008.* ✓

(c) *The units of* $AV_{[0,28]}$ *are*

Multiple Choice:

(i) *miles.*

(ii) *miles per gallon.*

(iii) *miles per gallon per year.* ✓

(iv) *miles per year.*

`ARoC6.tex`

Exercise 6 *Let* $f(x) = \dfrac{1}{x}$.

(a) *Compute* $AV_{[1,2]}$.

$AV_{[1,2]} = \boxed{-\dfrac{1}{2}}$.

(b) *Compute* $AV_{[100,101]}$.

$AV_{[100,101]} = \boxed{-\dfrac{1}{10100}}$.

`ARoC7.tex`

Exercise 7 *Let* $f(x) = x^3$.

(a) *Compute* $AV_{[3,5]}$.

$AV_{[3,5]} = \boxed{49}$.
